

STATISTICAL OBSERVATIONS
ON THE
GROWTH OF THE HUMAN BODY (MALES)
IN
HEIGHT AND WEIGHT,
FROM
EIGHTEEN TO THIRTY YEARS OF AGE.



BY J. T. DANSON, Esq.

READ BEFORE THE STATISTICAL SOCIETY, JANUARY 18, 1881.

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STATISTICAL OBSERVATIONS
ON THE
GROWTH OF THE HUMAN BODY (MALES)
IN
HEIGHT AND WEIGHT,
From Eighteen to Thirty Years of Age.

STATISTICAL OBSERVATIONS *on the GROWTH of the HUMAN BODY*
(MALES) *in HEIGHT and WEIGHT, from EIGHTEEN to THIRTY*
YEARS of AGE, as ILLUSTRATED by the RECORDS of the BOROUGH
GAOL of LIVERPOOL. *By J. T. DANSON, ESQ.*

[Read before the Statistical Society, 18th January, 1881.]

THE subject of this paper, lying as it does somewhat beyond the usual range of our inquiries, seems to need some apology. It is our province, however, to collect facts, and especially such as have a national value; and the excellence of a nation may be said to have its main root in a sound knowledge, and an apt use, of the human body. The animal man, as he exists in these islands, is the especial object of our patriotism. His good physical condition is the prime object of our public policy; but even his average height, and weight, when at maturity, or at what age he really attains that condition, may be said to be yet unknown. The delicacies, or the prejudices, of our time compel us to seek all such knowledge under difficulties. We have to resort, almost exclusively, to the dregs of the population. Hence we as yet know very little, and that little imperfectly; and hence the comparative poverty of the material, on a subject which might seem very simple and familiar, to which I have to invite your attention this evening.

About twenty years ago I had occasion to visit the borough gaol of Liverpool. It is at Walton, a few miles from the town. It is large, and was then recently built; and its mode of management was then, and I believe still is, about as good as any yet in use. Under the law then in force, each prisoner committed for more than one month was, as he entered, and again as he left, measured for height, and also weighed. The purpose of this practice was to afford to the medical officer in charge of the prisoners, some precise data on which he might base his observation of the effect upon them of the prison treatment. The practice of measuring and weighing the prisoners on their discharge was afterwards abandoned.

Bearing in mind the elaborate work of the eminent Belgian statist, M. Quetelet, "On Man, and the development of his Faculties," and remembering the very narrow basis on which, for want of fuller material, he had been compelled to found some of his most important conclusions, I saw here an opportunity of obtaining some valuable additional information. Having got access to the gaol

records, I found them, on examination, quite worth the labour to be given to them; and selected the figures relating to the years 1857 and 1858, as likely to afford a fair sample of the new material thus made available. The results, as analysed and thrown into a tabular form, were laid before this Society in November, 1861.* From these figures I found that only one inference of any value could, with any degree of certainty, be deduced: that being, that the men thus passed under examination did not, on an average, attain their full height, or their full weight, much, if at all, before 30 years of age.

The method I adopted in the first instance, was to take as a basis of average, from the entire list I had obtained of upwards of 4,800 entries of prisoners weighed and measured during the two years selected, the first hundred at each age, from 18 to 30, inclusive. I found I could get a full hundred at each of these ages, excepting only the age of 29. At that age there were only ninety-five in all. Up to the age of 22 I found a clear and nearly regular increase of height and weight with each additional year of age. After that the results became very irregular, though still showing, on the whole, an increase of both height and weight, up to the age of 29. For several of the ages from 23 to 28 years of age, therefore, I increased the number taken to form the average, from a hundred upwards, as far as the materials in hand permitted. But this only slightly changed the results, and left them still strongly marked with the irregular and anomalous character at first observed. For instance, the average height brought out for the age of 24 was still considerably less than that for 22, and the height for 26 less than that for 25 years.

This persistent irregularity induced me to refer, with some hope of an explanation, to a suggestion made some years before, by M. Millot, a French statist. After a careful examination of the figures resulting, during a long series of years, from the measurements of the annual draft of conscripts in that country, he had observed that the men of the same age, brought forward in successive years, differed considerably in their average height; and on a comparison of these returns with those of the annual prices of corn in the localities in which these men were born and reared, he observed some coincidence of deficient height in the conscripts with high prices in the years of their gestation and infancy. This led him to the conclusion that wherever a deficiency occurred, it might be due to early want of sufficient nutriment; and thence to defective harvests. But a corresponding examination of the figures before me in 1862 did not afford me any sufficient ground for

* See the Society's *Journal* for March, 1862, part 1, vol. xxv.

supposing that the anomalies I had met with could be traced to this cause.

I therefore simply recorded the figures as they stood, for the benefit of future inquirers; and, for the time, dropped the subject.

About ten years afterwards, appeared the very valuable "Manual of Practical Hygiene" of the late Dr. Edmund Parkes. I observed that, imperfect as my paper was, it had attracted his attention; and was to some extent relied upon as evidence of the mean height and weight of the men of the lower classes in England, at the ages dealt with.

Availing myself of the lapse of time, I then determined to ascertain the effect of a more extended use of the records of the same gaol; and, when the year 1878 had expired, I sought, and readily obtained, the sanction of the Home Secretary, and had extracted the weights and measurements of the prisoners received in the two years 1867-68, and again in the two years 1877-78: thus extending the basis of the inquiry over three periods of two years each; and these occurring at equal intervals during a total period of twenty-two years.

From these papers I have framed the tables I now lay before the Society.

During the eighteen years which have elapsed since I read my former paper, much larger masses of material than those handled by Quetelet have been got together on this subject, and the proper method of treating them has been developed with considerable success. But facts collected in other countries cannot be deemed applicable to the population of this; and I find in the figures collected by others in this country nothing to supersede, or even to elucidate my own. These have reference exclusively to criminals; and they would seem to differ, specifically, from those obtained elsewhere. They are also the only figures extending, year by year, from 18 up to 30 years of age.

And now, before inviting your attention to the results, I will state, shortly, what I have learned, or have reason to believe, as to the manner in which these figures have been obtained, and the degree of reliance we may perhaps safely place upon them.

First, as to the mode of measuring and weighing. The apparatus used seemed, when I saw it, to be well suited to the purpose—accurate and uniform in its operation, not easily put out of order, and requiring no special skill in its use.

The prisoner, on entering the gaol, is taken to a room kept for the purpose, and is there registered. As part of this process, he is put on to a broad metal plate, near the level of the floor. As he depresses this plate, his weight is indicated on a lever; and a projecting arm, sliding on a metal bar behind him till it touches his

head, marks his height on the bar. The weights are taken to pounds, and the heights to quarters of an inch; and are at once, with other particulars, recorded in a book close at hand. The process, with one exception, to be noted presently, appears to be the same now as it was twenty years ago. The duty of registering the prisoners being allotted to a special officer, and usually retained by him for a long period, being performed always in the same place, at about the same hour in the day, and with the same apparatus, and under similar surrounding conditions, is probably applied with a good deal of uniformity. But, as I shall have occasion to show, the work is at present done under difficulties, which tend to defeat any attempt to use its results for such purposes as ours.

Until January, 1878, the prisoners were measured in their foot-covering, whatever that might happen to be. At that date the practice was changed, by taking off their boots or shoes while being measured. This, of course, introduces a material irregularity into one group of the figures before us. But I am not disposed altogether to regret this. Whenever and wherever we may be able to extend these observations, if it is deemed desirable to do so, we shall invariably be met by the difficulty here suggested. To get the heights of men (who are not in prison) with their foot covering, will always be much easier than to get them without; and to learn in time something of the average effect of such covering is therefore desirable. On being informed of this change, I separated, as well as I could, the measurements taken after it; and so framed an additional table for the last group (that of 1877-78). But it is obvious that only a comparison of *the same* group of men, with and without foot covering, can give us any clear indication of its ordinary effect on the apparent height; and should the Society deem the subject worthy of further attention, it would be advisable, and probably not difficult, seeing that our prisons are now all under the control of the Home Office, to have these measurements taken, for a time, in a few selected districts, with and without such covering: so that, as to the imprisoned population at least, we may have some trustworthy data for the allowance to be made.

So much for the probable accuracy of what we are told as to the height and weight of these men; but for our present purpose accuracy on these points is of little value, except in so far as it may be coupled with accuracy in the statement of the age of each prisoner. Here there is ground for doubt: ground which I fear we shall not easily get rid of. The officer making the record has to rely upon what he can gather from three sources of information; and these, whether taken separately or together, cannot be deemed at all conclusive. First, there is the statement of the prisoner. The

value of this of course depends on his knowledge of the truth, and his willingness to tell it. But it is certain that many men of the class which mainly supplies these prisoners are imperfectly informed as to their own age; and it is perhaps hardly less certain that, when they know it, they are little disposed to shape their answer by what they do know. They are moved rather by what they wish to have believed. There is, however, between the ages of 18 and 30 no very strong temptation wilfully to mis-state their age: the diet and other treatment being uniform after the age of 16.

Besides the statement of the prisoner, there is his appearance; and it is probable that an officer habitually charged with the duty acquires some skill in the use of this test, as a check on any wide mis-statement.

And, finally, there is such previous personal acquaintance as the officer, or those about him, may have with the prisoner; and this check comes into operation in many instances.

I now turn to the tables constructed from the whole of the figures before me. They are six in number. Tables A, B, and C, give the heights of the men measured in the three periods, 1857-58, 1867-68, and 1877-78. Tables D, E, and F, give the corresponding weights for these three periods.

TABLE A.—*Heights, 1857-58.*

Age.	Number Measured.	Average.	Maximum.	Minimum.	Maximum over Average.	Minimum under Average.	Maximum over Minimum.
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18.....	200	64·29	71·0	58·5	6·71	5·79	12·5
19.....	200	64·87	71·5	58·25	6·49	6·62	13·11
20.....	200	65·19	73·0	61·0	7·81	4·19	12·0
21.....	200	65·78	72·0	60·5	6·22	5·28	11·5
22.....	200	66·21	73·0	60·25	6·79	5·96	12·75
23.....	200	66·17	73·0	59·0	6·83	7·17	14·0
24.....	185	65·94	73·0	57·0	7·06	8·94	16·0
25.....	200	66·30	72·0	59·0	5·7	7·3	13·0
26.....	130	66·15	73·75	57·5	7·6	8·65	16·25
27.....	138	66·38	71·75	61·0	5·37	5·38	10·75
28.....	100	66·65	73·0	61·0	6·35	5·65	12·0
29.....	95	67·02	72·5	61·25	7·48	5·77	13·25
30.....	100	66·36	73·0	60·75	6·64	5·61	12·25
	2,148	—	—	—	—	—	—

TABLE B.—*Heights*, 1867–68.

Age.	Number Measured.	Average.	Maximum.	Minimum.	Maximum over Average.	Minimum under Average.	Maximum over Minimum.
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18.....	299	64·94	70·75	53·5	5·81	11·44	17·25
19.....	249	65·56	77·0	58·75	12·44	6·71	19·25
20.....	260	66·10	72·75	56·25	6·65	9·85	16·5
21.....	247	66·31	74·0	61·0	7·69	5·31	13·0
22.....	294	66·0	74·0	59·0	8·0	7·0	15·0
23.....	237	66·39	73·5	58·75	6·11	7·64	13·75
24.....	251	66·25	74·0	59·25	7·75	7·0	14·75
25.....	193	66·78	75·5	56·5	8·72	10·28	19·0
26.....	176	66·54	73·0	59·5	6·46	7·04	13·5
27.....	175	66·87	73·25	61·0	6·38	5·87	12·25
28.....	161	66·7	76·0	60·0	9·3	6·7	16·0
29.....	108	67·33	74·5	56·5	7·17	10·83	18·0
30.....	184	66·86	73·5	61·0	6·64	5·86	12·5
	2,804	—	—	—	—	—	—

TABLE C.—*Heights*, 1877–78.

Age.	Number Measured.	Average.	Maximum.	Minimum.	Maximum over Average.	Minimum under Average.	Maximum over Minimum.
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18.....	433	64·08	69·75	57·5	5·67	6·58	12·25
19.....	365	64·74	70·0	59·0	5·26	5·74	11·0
20.....	365	65·05	70·75	59·5	5·70	5·55	11·25
21.....	369	65·4	70·75	58·25	5·35	7·15	12·5
22.....	406	65·65	71·75	59·25	6·10	6·40	12·5
23.....	320	65·42	72·25	59·0	6·83	6·42	13·25
24.....	307	65·42	71·75	58·0	6·33	7·42	13·75
25.....	235	65·66	73·0	59·5	7·76	5·74	13·5
26.....	235	65·64	72·75	57·0	7·11	8·64	15·75
27.....	216	65·82	73·0	58·5	7·18	7·32	14·50
28.....	241	65·73	74·25	60·0	8·52	5·73	14·25
29.....	135	66·33	74·0	59·25	7·67	7·08	14·75
30.....	192	65·52	72·25	61·5	6·73	4·02	10·75
	3,819	—	—	—	—	—	—

TABLE D.—*Weights, 1857-58.*

Age.	Number Weighed.	Average.	Maximum.	Minimum.	Maximum over Average.	Minimum under Average.	Maximum over Minimum.
		Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
18.....	200	122·35	158·0	90·0	35·65	32·35	68·0
19.....	200	129·66	182·0	99·0	52·34	30·66	83·0
20.....	200	132·8	176·0	105·0	43·2	27·8	71·0
21.....	200	133·83	170·0	101·0	36·17	32·83	69·0
22.....	200	139·31	184·0	98·0	44·69	41·31	86·0
23.....	200	141·89	195·0	109·0	53·11	32·89	86·0
24.....	185	142·0	180·0	110·0	38·0	32·0	70·0
25.....	200	143·79	190·0	110·0	46·21	33·79	80·0
26.....	130	142·06	190·0	96·0	47·94	46·06	94·0
27.....	138	144·27	192·0	101·0	47·73	43·27	91·0
28.....	100	142·62	184·0	105·0	41·28	37·62	79·0
29.....	95	145·53	194·0	116·0	48·47	29·53	78·0
30.....	100	141·55	197·0	113·0	55·45	28·55	84·0
	2,148	—	—	—	—	—	—

TABLE E.—*Weights, 1867-68.*

Age.	Number Weighed.	Average.	Maximum.	Minimum.	Maximum over Average.	Minimum under Average.	Maximum over Minimum.
		Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
18.....	299	124·81	193	101	68·19	23·81	92
19.....	249	129·68	196	100	66·32	29·68	96
20.....	260	136·82	181	108	44·18	28·82	73
21.....	247	138·92	174	105	35·08	33·92	69
22.....	294	138·4	179	101	40·6	37·4	78
23.....	237	140·5	180	100	39·5	40·5	80
24.....	251	139·55	189	104	49·45	35·55	85
25.....	193	143·09	202	102	58·91	41·09	100
26.....	176	143·09	180	104	36·91	39·09	76
27.....	175	142·87	215	111	72·13	31·87	104
28.....	161	144·18	187	108	42·82	36·18	79
29.....	108	145·33	190	99	44·67	46·33	91
30.....	184	144·1	210	105	65·9	39·1	105
	2,804	—	—	—	—	—	—

TABLE F.—Weights, 1877-78.

Age.	Number Weighed.	Average.	Maximum.	Minimum.	Maximum over Average.	Minimum under Average.	Maximum over Minimum.
		Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
18.....	433	125·09	164	89	38·91	36·09	75·0
19.....	365	132·69	164	101	31·31	31·69	63·0
20.....	365	136·57	172	100	35·43	36·57	72·0
21.....	369	138·81	173	109	34·19	29·81	64·0
22.....	406	141·65	199	106	57·35	35·65	93·0
23.....	320	142·52	196	100	53·48	42·52	96·0
24.....	307	140·92	178	108	37·08	32·92	70·0
25.....	235	142·69	190	110	47·31	32·69	80·0
26.....	235	143·01	218	101	74·99	42·01	117·0
27.....	216	144·83	200	109	55·17	35·83	91·0
28.....	241	143·96	186	110	42·04	33·96	76·0
29.....	135	147·5	184	121	36·5	26·5	63·0
30.....	192	143·94	210	98	66·06	45·94	112·0
	3,819	—	—	—	—	—	—

The material used for Tables A and D were laid before the Society in 1862; but rather less fully than at present. Finding it distinctly desirable to base the average not upon an uniform number, but upon the largest number obtainable, at each age, I have again been through the figures for the period 1857-58, and have increased the numbers as far as practicable. This I find makes no material change in the results; but it excludes a doubt which might otherwise attend a comparison of the table of 1857-58 with those of the later periods.

The number of men of the specified ages measured and weighed in 1857-58 was 2,148; in 1867-68 it was 2,804; and in 1877-78 it was 3,819. The increase in the two later periods was due, in some degree, to a change of practice. In the first period, only those were measured who were committed for one month or more; afterwards, all who were committed were measured. The total number of measurements before us is therefore 8,871.

It will be observed that I have deduced from the figures before me only the *average* heights and weights, and have not attempted to deduce the *means*. Undoubtedly the *mean* heights and weights have, as a rule, greater significance; but my main purpose was to mark the period of *maturity*; and this purpose was attained more simply, and obviously, and with sufficient accuracy, as it seemed to me, by taking only the averages. Further, these figures have been, it will be observed, from the first, somewhat vitiated, in my opinion,

by the apparent errors in the distribution of the given heights and weights to the proper ages; and these errors would have rendered almost worthless the result of any attempt, by using the method of *means* to develop the more precise significance of the figures.

By way of making more distinctly apparent the contents of the tables, I have also framed for each table a diagram. A glance at these diagrams will at once show the general character of the results. This is nearly the same for each of the three periods. It will be seen that, up to the age of 22, there is, in each group, a rapid and tolerably steady increase year by year, in both height and weight. Then, from 22 to 29 there is a further general increase, but it takes place, in each of the three groups alike, by steps which are strongly suggestive of our not having the true figures before us. It will be observed that, in this respect, the anomalous character of the comparatively small number of figures obtained twenty years ago is distinctly repeated ten years later, and again recently.

It is clear that we have here some general disturbing cause, affecting each group alike.

In Table A the average heights at ages 23, 24, 25 and 26 are obviously deficient. Also in Table D, giving the corresponding weights, there is a corresponding deficiency. It is less marked, but it is still apparent. In Table B, giving the measurements of the years later, the heights at the ages 22, 23, 24, 26 and 28 are also obviously deficient; and in Table E, which gives the corresponding weights, there is a similar deficiency at the ages 22, 24, 26 and 27. And in Tables C and F, giving the heights and weights of 1877-78, we find the heights and weights attributed to the ages 23, 24, 25, 26 and 28 also similarly deficient.

Now, reverting to what I had occasion to say of the evidence on which the ages are recorded, it may be useful to mark the fluctuations in the numbers of prisoners registered at each age. Are these apparently consistent with a correct statement of the ages of the men measured? We know that, in the general population, the number of males living at 30 years of age is about 13 per cent. less than the number living at 18, and that the annual decrease between these ages is very gradual. But with this variation we have here to take into account another and much wider one. I mean the variation of the apparent tendency to crime at different ages. This is, in the present instance, by far the more important. Unfortunately, however, though we know that it exists, and that it is considerable, we cannot with any degree of confidence affirm more than that the number of males brought within the grasp of the criminal law bears the largest proportion to the number living, at, or about, the age of 26; and all that we know on the subject

comes to us, as regards the ages of the criminal population, on evidence no stronger than that now before us.

Yet it is impossible, I think, to consider with any care the numbers of men measured at different ages, as shown in these tables for 1867-68, and also in those for 1877-78, without a strong temptation to infer that the numbers stated are incorrect; and are relatively deficient at 23 and 24, and still more so at 25, 26, and 27. We may thence fairly suspect, seeing how the ages must have been obtained, that some men, of the ages thus marked as deficient, have been placed elsewhere.

Are there, then, any numbers which may be said to be excessive? I think we may say that the number given as 30 years of age is probably thus excessive. It seems so in all the three groups. Also, it will be seen that the average height and weight given to that age is remarkably deficient; in fact, these are just what they would be made by placing under the age of 30 some of the men who should have appeared as three or four years younger.

Further, let us observe the figures as to the age of 29. In each of the three groups this also is strongly marked. The number of men stated to have been measured at this age is in each group the smallest.

Now it may perhaps safely be assumed, on the basis of common experience, that the age of 29 is unlikely to be given except by a person who both knew the truth and was disposed to state it. One who did not know, or who wished to deceive, or who only guessed, or was merely careless, would hardly stop short of 30. Hence, probably, those given as of this age were really so. And if we turn to the heights and weights which in the three several groups are associated with this age, we find them remarkably exceptional: as being singularly free from the apparent disturbances affecting all the others from the age of 23 upwards; and if for a moment, resorting to conjecture, we discard the heights and weights given from age 23 to 28, or use them freely as the elements of a progressive curve, advancing over unknown ground, but on a line suggested by the figures of the ages from 18 to 22, we find that such a curve would readily adjust itself to the average height and weight actually given for the age of 29.

Some consideration should perhaps be given to the probable source of the assumed greater intelligence of the few men set down as aged 29. It suggests their having come from a class higher than that which supplies the average criminal; and hence their having been better nurtured, and for that reason being somewhat taller and heavier.

One conclusion, however, at least seems clear. Though we may admit it to be probable, if not proved, that the men of the same

locality and class reaching any particular age between 18 and 30, in any given year, will not have precisely the same average height or weight as the men of the same age in years preceding or subsequent, it is evident that no such variation, however considerable or however well established, could explain the figures before us. Each of the tables before us starts at a date just ten years removed from the starting point of the next, and runs through a series of thirteen years. The unexplained fluctuations occur at nearly the same points in each group, and they are therefore clearly not to be explained by any theory which would trace deficient height or weight to increased cost of food at the period of infancy.

Now let us turn, for a moment, to the figures which, on good authority, have been made public from other sources, touching the same subject, of late years.

In Mr. Charles Roberts's "*Manual of Anthropometry*," we have several tables of the average heights of males, taken from an early age up to 21 or 22 years of age, and one or two giving the ages separately, up to 24 years of age. But it would appear that either Mr. Roberts did not extend his observations to the later ages, with regard to each successive year, or that he found no notable difference to record after 24 or 25 years of age. And it is also to be borne in mind, in so far as his tables may be compared with those before us, that his tables, where they can be so compared with these, have reference to naval and military cadets, and medical and university students, and that mine refer exclusively to criminals; and such differences as we find may probably be traced to this difference of class.

We find that in 1857-58 the criminal class gave an average height at 21 years of age of 65·78 inches; in 1867-68 a height of 66·31 inches; and in 1877-78 a height of 65·4 inches. Correcting the latter for error in not including foot covering for part of the men measured, by adding one-third of an inch, we have (very nearly) a common average of 66 inches for the age of 21, in the criminal population. Mr. Roberts found among the cadets and students, at 21 years of age, an average height of 69·16 inches. This was taken without shoes. Adding only half an inch for this, we have a height of 69·66 inches, or about $3\frac{1}{2}$ inches more, in the higher class, at 21 years of age.

But if we extend the comparison to 24 years of age (and I regret that Mr. Roberts's figures do not enable us to extend it further), we find the comparative figures, obtained in the same way, to be for the criminal class 66·20 inches, and for the others 69·28 inches, showing a difference in favour of the higher class, at the later age, of only 3 inches; and if we may infer from

Mr. Roberts's tables that he found no material increase of the average height in the class he measured after 24 years of age, then, as we do find such an increase here, we have some ground for conjecture that the growth of the criminal class, though less at the earlier ages, is partly compensated by a continuance of it to a later age. At the age of 29 we have a common average height, in the tables before us, of fully 67 inches, which is only about $2\frac{1}{4}$ inches less than the highest average recorded by Mr. Roberts for the higher class.

The tables of weights seem to confirm, generally, the inferences to be drawn from the tables of heights.

The maxima and the minima, in both sets of tables, are worthy of careful consideration; but this part of the subject lies somewhat apart, and time does not permit of my going into it.

The group of 1877-78, as to heights, calls for some special consideration, with reference to the fact that more than half of the men included in it were measured without their foot covering. In Table G I have shown the result of dividing the men, as nearly as I could, into the two groups thus distinguished; and the effect is also shown on the diagram of heights for this period, in the course of the two lines (red and blue) added to that diagram.

TABLE G.—*Heights, 1877-78. As taken partly with, and partly without, Foot Covering.*

Age.	Number measured with Foot Covering.	Average.	Number measured without Foot Covering.	Average.
		Inches.		Inches.
18	210	63·9	223	64·19
19	171	64·89	194	64·59
20	179	65·14	186	64·49
21	170	65·65	199	65·2
22	196	65·77	210	65·54
23	151	65·51	169	65·38
24	162	65·8	145	65·0
25	102	65·91	133	65·42
26	99	65·82	136	65·55
27	97	66·0	119	65·57
28	110	65·55	131	66·26
29	53	66·73	82	66·07
30	82	66·04	110	65·12
	1,782	—	2,037	—

In two instances, at 18 years of age, and again at 28, the average height of the men measured without foot covering comes out greater than that of the men measured, in the previous year, at the same ages, with foot covering. I suspect some error in the figures here; but I have not been able to discover it. If we take the aggregate, in each case, and compare the averages with each other, it appears

that the 1,782 men measured with foot covering were taller, by one-third of an inch, than the 2,037 men measured without foot covering. The governor of the gaol estimates the actual difference at about three-quarters of an inch. This I should suppose to be excessive. On the other hand, I do not think it extremely improbable that the men of 1878 were, generally, somewhat shorter than those of 1877. And in the absence of precise information as to the fact, I should not be disposed to allow, on conjecture, more than two-thirds of an inch, for the excess of height of any large number of Englishmen measured in boots or shoes.

The most general, indeed the only common use of such inquiries as the present is, of course, a military one. Every inch in height seems to carry with it, on an average, something more than 2 lbs. in weight; and, together, they confer a distinct advantage in personal conflict.

I have therefore taken out from each group the men who, at each age, appear to have attained the height of five feet three inches, five feet six inches, and five feet eight inches, respectively. These are shown in Tables H, I, and K.

TABLE H.—*Number of Men, per Cent., who appear to have attained the height of Five Feet Three Inches, at each Age, in each Period.*

Age.	1857-58.	1867-68.	1877-78.
18.....	70·0	80·0	71·1
19.....	86·0	89·1	81·1
20.....	87·0	93·0	87·4
21.....	90·0	95·0	92·1
22.....	94·0	92·0	89·4
23.....	94·0	95·0	90·0
24.....	91·0	92·4	83·5
25.....	92·5	94·7	87·2
26.....	93·9	95·6	87·2
27.....	96·0	96·6	88·0
28.....	96·0	93·8	93·3
29.....	99·0	96·3	95·5
30.....	98·0	92·4	86·4

TABLE I.—*Number of Men, per Cent., who appear to have attained the Height of Five Feet Six Inches, at each Age, in each Period.*

Age.	1857-58.	1867-68.	1877-78.
18.....	27·0	33·7	17·5
19.....	40·0	34·1	31·7
20.....	39·0	52·3	32·8
21.....	43·0	55·5	42·0
22.....	49·0	51·0	46·5
23.....	55·5	59·9	40·0
24.....	54·5	56·5	45·3
25.....	44·0	66·8	43·8
26.....	55·0	60·0	45·5
27.....	60·0	72·0	48·1
28.....	60·0	62·1	48·9
29.....	68·0	78·7	53·3
30.....	51·0	70·6	48·9

TABLE K.—*Number of Men, per Cent., who appear to have attained the Height of Five Feet Eight Inches, at each Age, in each Period.*

Age.	1857-58.	1867-68.	1877-78.
18.....	6·0	8·6	3·6
19.....	12·0	11·2	8·7
20.....	9·5	26·1	7·6
21.....	16·0	30·4	12·4
22.....	23·0	23·4	19·2
23.....	28·0	23·2	15·0
24.....	24·3	23·1	14·66
25.....	29·0	37·3	22·5
26.....	24·6	33·5	15·7
27.....	26·0	32·9	23·1
28.....	29·0	36·5	12·4
29.....	36·0	46·3	27·4
30.....	28·0	37·0	20·8

The figures here present of course, the same general anomalies as those of the previous tables. But one feature in these records they bring out rather more clearly than before: that is the less height, at each age, of the men of 1877-78 as compared with the men of 1867-68, and even as compared with those of 1857-58. Part of this is at once accounted for by the fact, already noticed, that rather more than half of the men of 1877-78 were measured without foot covering. But this does not appear to justify a greater difference at most than two-thirds of an inch. And if we turn to Table B, giving the heights for 1867-68, and take the common average height due to the five years from 18 to 22 years of age, we get the figures 65·78, or five feet four inches and three-quarters. The corresponding figures for 1877-78 are 64·98 inches, or exactly four-fifths of an inch less. The same comparison for the

ages 23 to 26, gives 66·49 inches in the earlier, and 65·53 inches in the later period—or nearly an inch of difference. And, in like manner, for the ages 27 to 30, we have the figures 66·94, followed by 65·85, showing more than an inch of deficiency in the later period. On the whole, it would seem that the men of 1877-78 were, on an average, at each age, at least half-an-inch shorter than the men of 1867-68. But this is not confirmed by a comparison of the tables of weights. We find that the men of the later period were, generally, the heavier.

But it seems now to be well understood among those best acquainted with the subject, that mere height and weight in a soldier, as in others working in the open air, is of less consequence than maturity. The late Dr. Parkes, in his “Manual of Practical Hygiene” (fourth edition, pp. 493 and 494), drew the attention of our naval and military authorities to some important details in the final growth of the bones and muscles of the human body, whence it is to be inferred that the men of this and other European countries do not, in fact, arrive at physical maturity till they are about 30 years of age; and so do not, before that age, acquire their full capacity for exertion and endurance.

The figures now before us, imperfect as they are in other respects, certainly lead us directly to the same conclusion. But this widely differs from the popular notion. That has long and widely consecrated the age of 21, or thereabouts, as the age of maturity. The armies of the world, in accordance with the popular notion, have long been, and still are, composed mainly of men much under thirty years of age. Our own recruits are accepted at 18, and often, through deception, at less. Yet the marches, the privations, and the exposure of a campaign have always strewn the roadsides, and filled the hospitals, mainly with the younger men. Now it can hardly be doubted that, for all severe physical exertion or endurance, the conditions are the same; and if this be so, we have, for lack of sound statistics, long been practising, with most precious material, a most unsound economy.

I trust, therefore, that unsatisfactory as this paper is, in many respects, it may be of use: if only as attracting additional attention to a subject of some importance, and suggesting more careful collection, and more considerate use, of the order of facts on which it is founded.

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PREVENTIVE AND REFORMATORY EDUCATION

OF

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